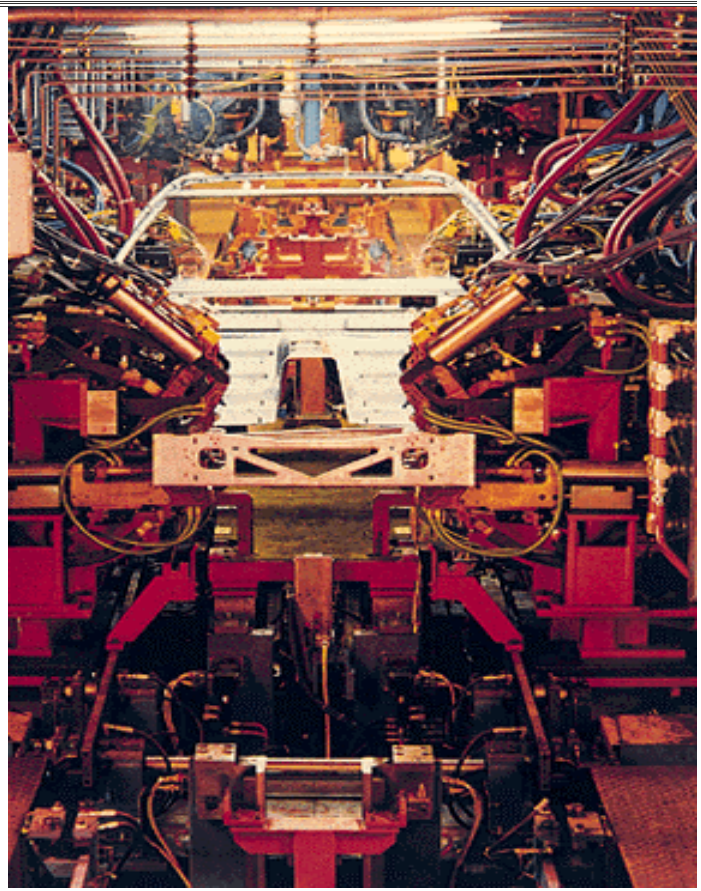
Integrating Control and Information in Manufacturing Systems using Open Protocols

Leveraging the success of NetLinx and the Logix platform together to provide a distributed control solution on ***EtherNet/IP, ControlNet, DeviceNet***



NetLinx

TAKE CONTROL Logix

Andreas Somogyi
Program Manager
EtherNet/IP

Allen-Bradley
RELIANCE ELECTRIC
DODGE
ROCKWELL SOFTWARE
Rockwell Automation

What Are Today's Industry Requirements

- ***Control -***
  - real-time I/O control, Interlocking, etc.
- ***Configure -***
  - device configuration, program up/download, etc.
- ***Collect -***
  - data acquisition, diagnostic, preventive maintenance, etc.

CONTROL CONFIGURE COLLECT

DATA OVER THE SAME WIRE

Media Independent Producer/Consumer Services provided on a NetLinx Network

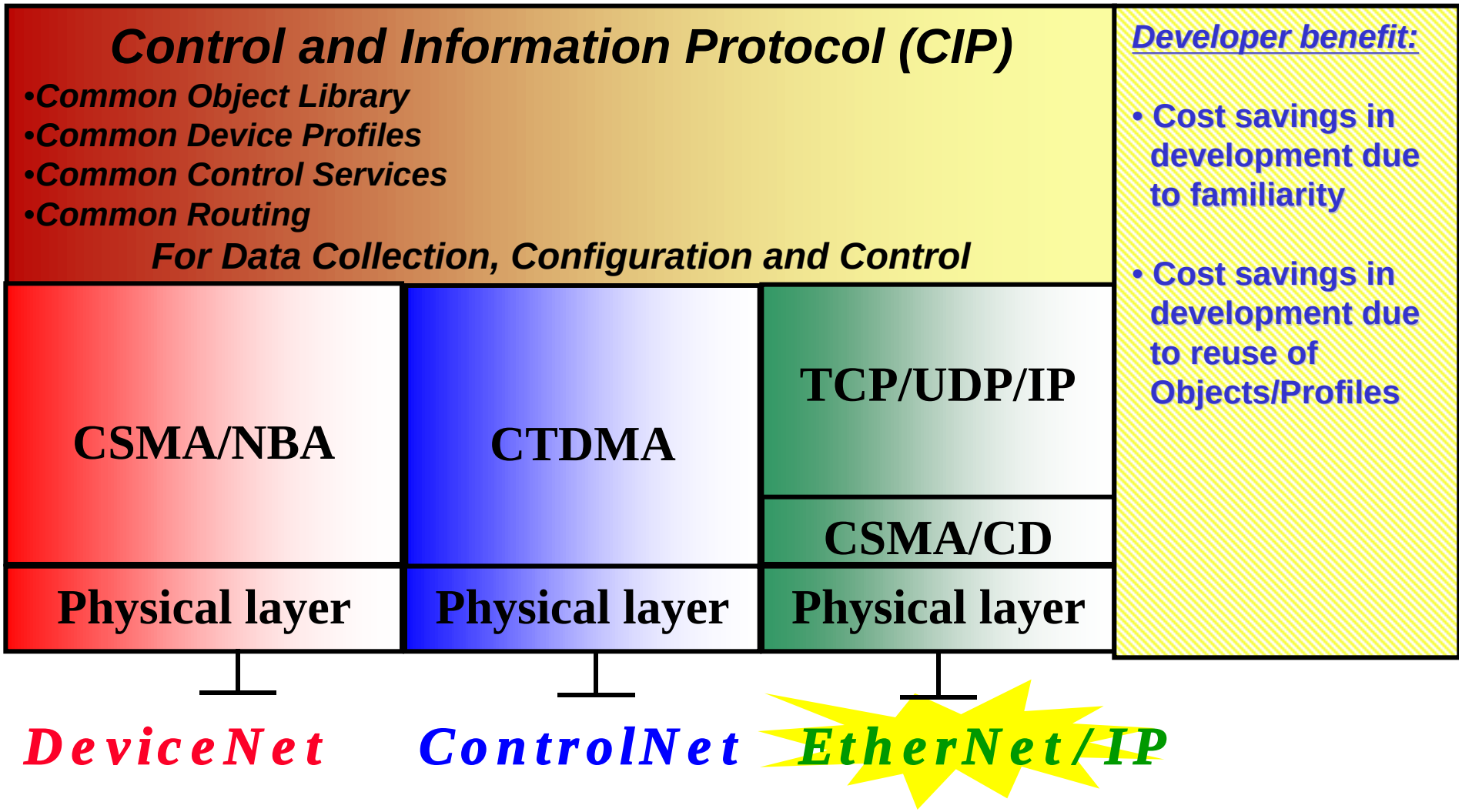
		DeviceNet	ControlNet	EtherNet/IP
1	**Messaging Types**			
	I/O Control (implicit)	✓	✓	✓
	Messaging (explicit)	✓	✓	✓
	Both at the same time	✓	✓	✓
2	**Node Relationships**			
	Master/Slave	✓	✓	✓
	Multimaster	✓	✓	✓
	Peer-to-Peer	✓	✓	✓
3	**I/O Exchange**			
	Polled	✓	✓	✓
	Cyclic	✓	✓	✓
	COS (Change of State)	✓	✓	✓
4	**Delivery Mechanisms**			
	One:One (point-to-point)	✓	✓	✓
	One:Many (multicast)	✓	✓	✓
	One:All (broadcast)	✓	✓	✓
	Routable Protocol	✓	✓	✓

Customer benefit:

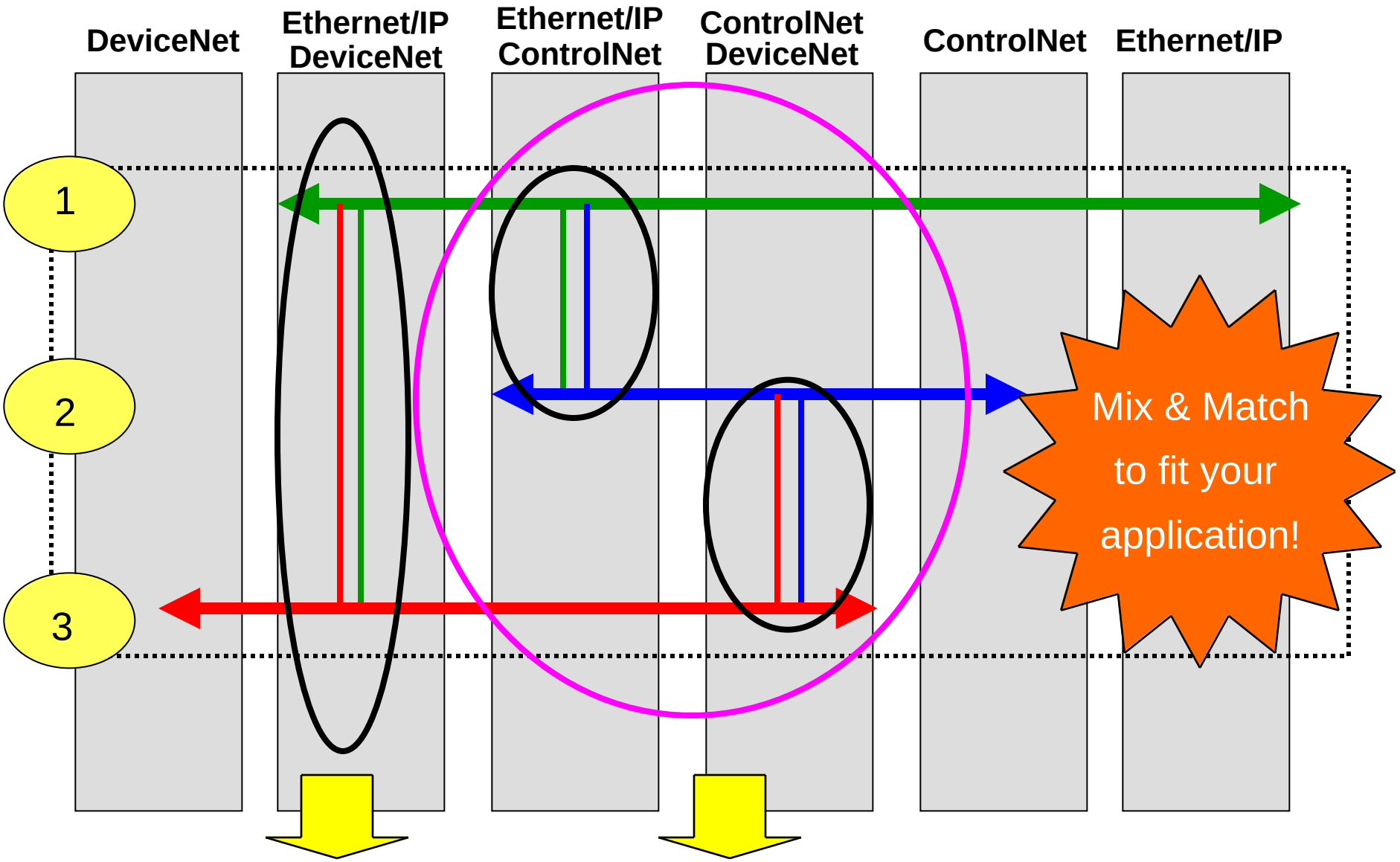
- **reduced cost due to Savings in wiring, and installation**
- **Time savings due to less programming**
- **Enhanced productivity due to efficiency on the wire**
- **Time savings due to less programming**
- **Access from anywhere to anywhere**

Control and Information Protocol (CIP)

- CIP protocol implemented on all 3 core networks: DeviceNet, ControlNet, EtherNet/IP



NetLinx Architecture Offers Flexible Options



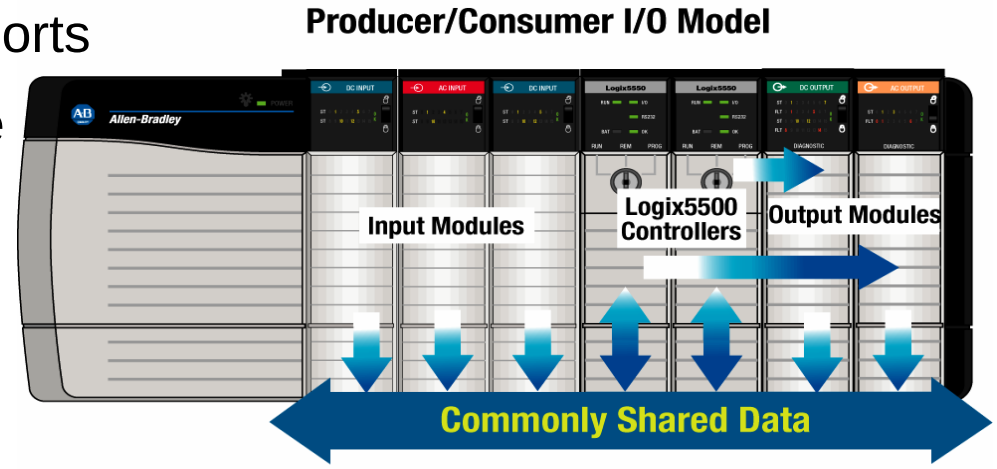
Example: 1+3 or 1+2 or 2+3 or 1+2+3 = NETLINX

NetLinx ties into Logix PLC's

Used for all NetLinx services across DeviceNet, ControlNet, Ethernet/IP, AND across the Control Bus backplane

- **Input modules produce data for the system**
- **Controllers and Output modules are producers and consumers**
- **Multiple devices can simultaneously consume data**

- The ControlLogix Chassis supports routing without a processor due to CIP on the backplane



OPENESS of DeviceNet, ControlNet, EtherNet/IP

- Sponsorship by ODVA and CI Consortia about 400 member companies Worldwide
  - ODVA and CI endorse EtherNet/IP to 100%
  - 6 Joint Special Interest Groups (JSIG) between ODVA and CI are formed to
    - market, maintain, enhance and to provide the necessary conformance tests for EtherNet/IP
- Industrial Ethernet Association (IEA) leading US consortia about 35 members
  - endorse EtherNet/IP beside others (no exclusivity)
- IAONA leading consortia in Europe about 150 members mostly German companies
  - endorsing EtherNet/IP beside others

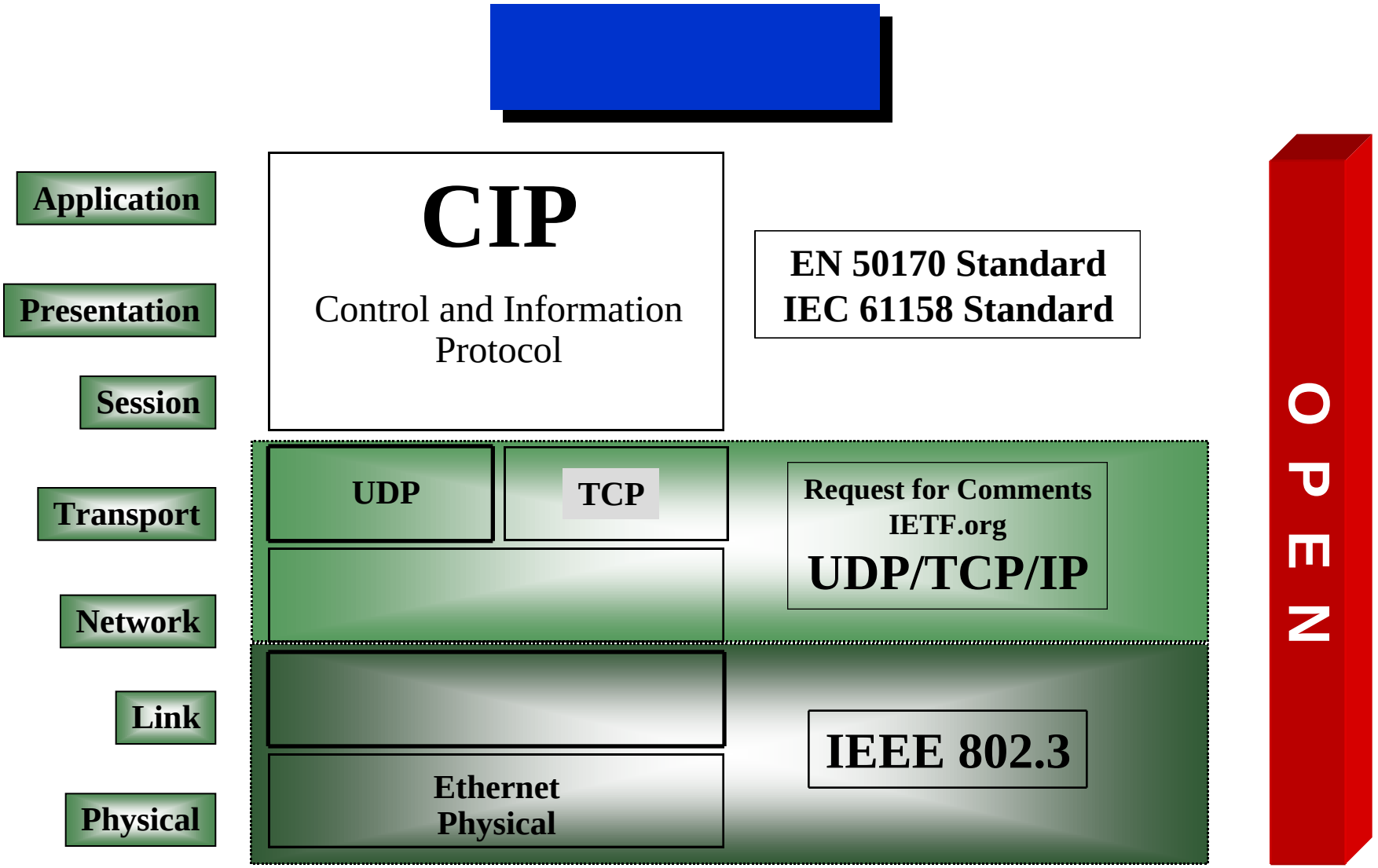
ControlNet International
The Association for Users of ControlNet

ODVA

INDUSTRIAL ETHERNET

iaona EUROPE

EtherNet/IP Communication Stack



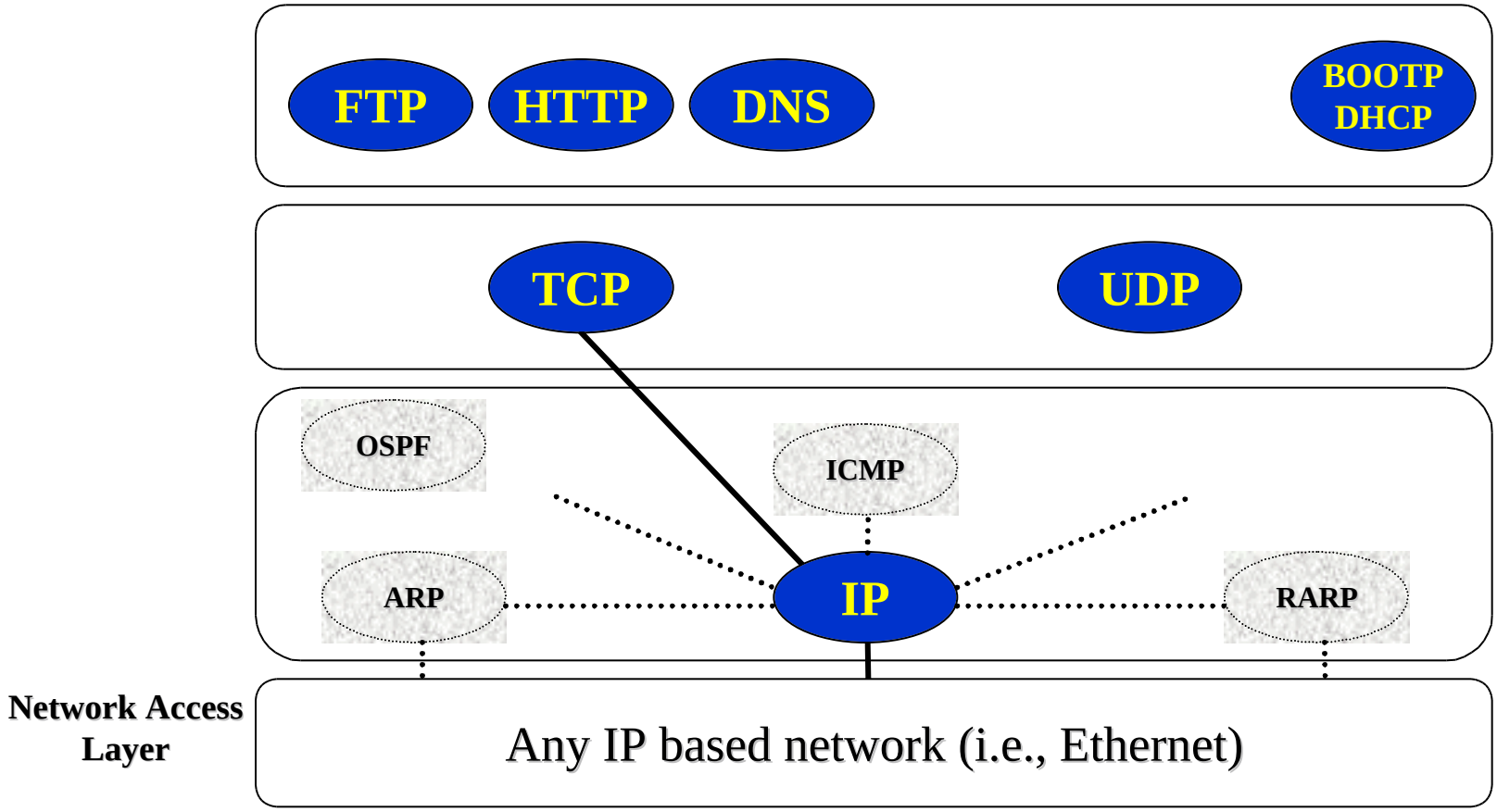
Object Orientated Application Layer Protocol

3rd Party Enablers Support

- **EtherNet/IP Freeware launched 7/00**
  - Example Code Toolkit
    - EtherNet/IP Target device
  - CIP Protocol Analyzer
  - Example applications on NT
  - Documentation

- **How are we doing so far?**
  - 850 people from 650 companies have downloaded the enablers tools from the ODVA / CI web site
  - 320 developers from 150 companies have attended EtherNet/IP technical training
  - Survey says:
    - 74% of companies responding to a recent survey indicated that they are either developing, or have plans to develop EtherNet/IP products

EtherNet/IP and the TCP/IP Protocol Suite



Ethernet - Misconceptions

Misconception #1 It's cheap

Misconception #2 I can use COTS products on the plant floor

Misconception #3 100Mb Ethernet will outperform everything

Ethernet - Misconceptions

It's cheap! - **I can use COTS products on the plant floor**

- COTS products are not as reliable as industrial products
  - Temperature rate, MTBF - industrial Ethernet products are about 3-4 times more expensive - **adds cost**
- You need to add cost for every point to point connection due to the use of a hub/switch - **adds cost**
  - If an Ethernet switch fails all connected nodes will fail too
- Additional effort to address Security issues with open systems - **adds cost**

Cost savings are in maintenance and support, not on the initial purchase

Ethernet - Misconceptions

100Mb Performance will be incredible

- The bottleneck for performance is frequently the end node not the wire speed
  - 10Mb Ethernet is not twice as fast as 5Mb ControlNet
  - 100Mb Ethernet will not be 10 times faster than 10Mb

Ethernet Pros

- **Pros**
  - ***Existing knowledge*** about Ethernet is tremendous
  - Well established network standard, ***customer acceptance*** rate is favorable
  - Common set of ***installation and support tools***
  - Easy access to and from the ***Internet***
  - **Simple** to wire, easy to debug and maintain
  - Support of 10/100Mb in star topology

1000's Ethernet products with all kind of functionality are already on the market

Rockwell Automation - Leadership Role

With NetLinx and Logix an Architecture made up of *open Networks* and *Open Interfaces* that allow you to:

Control, Configure, and Collect

information and data *efficiently*.

NetLinx

TAKE CONTROL Logix